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Small Rural Cities as Habitat for Amphibians and Reptiles: The Example of Jonesboro, Union County, Illinois

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Through willful destruction for food or pleasure and, more potently, through the destruction of old environments to make way for new ones more suited to his own needs, man has been an influence for good or evil to nearly all of his fellow creatures.—Robertson, 1930

Abstract

As natural habitats are converted for human use they often become unsuitable for indigenous fauna. Some species of amphibians and reptiles, however, co-exist with humans in urban and rural environments. I informally examined the amphibian and reptile community of Jonesboro, Union County, Illinois, from April 1996 through December 2017. Within city limits, I observed 26 species of amphibians and reptiles comprising one salamander, 11 frogs, five turtles, two lizards, and seven snakes. One additional species of frog and salamander were observed in a fishless pond 60 m outside the city limit. Small rural cities can provide suitable habitat for amphibians and reptiles and may contribute to herpetofaunal diversity at the landscape level.

Introduction

Earth has entered a new geologic epoch, the Anthropocene, in which humans have become a global geophysical force (Steffen et al., 2007). Approximately half of Earth's land surface has been altered by human action and more than half of all accessible surface fresh water is used by humanity (Vitousek et al., 1997). Agriculture, in particular, is one of the most significant human alterations to the global environment (Matson et al., 1997). Clearing land for crops and permanent pasture has reduced the amount of natural habitat on agriculturally usable land across the globe by more than half, and much of the remainder has been modified by temporary grazing (Green et al., 2005).

Many agricultural practices are chemically and mechanically dependent, and vast acreages of land are devoted to monoculture crop production which has resulted in a loss of farmland biodiversity (Benton et al., 2003). As a leader in commodity crop production, Illinois exemplifies this increasing trend in agricultural intensification. Approximately 85% of Illinois has been converted for agricultural or urban uses (Iverson, 1988), and only 0.045% of the state remains in a relatively natural, undisturbed condition (White, 1987). Intensive, "clean" agricultural practices and landscape-level single-crop production have resulted in loss of wildlife habitat on Illinois agricultural lands (Ribic et al., 1998). Amphibians and reptiles, especially habitat specialists, are increasingly confined to islands of natural habitats such as those occurring in state parks and wildlife management areas, national forests and wildlife refuges, and county, municipal, or private preserves.

Conservation of natural habitat remnants and the restoration of degraded habitats are crucial to wildlife conservation. However, it is not possible to conserve enough land containing sufficient habitat diversity to provide all species of wildlife the ability to maintain perpetual, self-sustaining populations (Roll et al., 2017). Fortunately, provision of wildlife habitat within human-inhabited landscapes can also provide a suitable environment for numerous wildlife species (Rosenzweig, 2003), including amphibians and reptiles (Mollov, 2005; Rubbo and Kieseker, 2005; Ackley and Meylan, 2010; Grant et al., 2011; Linares and Eterovick, 2013). Here, I examine the small, rural city of Jonesboro, Union County, Illinois, as habitat for amphibians and reptiles. Small rural communities may provide habitat diversity not available in intensive agricultural settings or large urban areas.

Methods

The city limit of Jonesboro, human population ~1800, encompasses approximately 7 km^2 of central Union County in extreme southwestern Illinois (37°27"N, 89°16"W; Figure 1). Jonesboro is within the Shawnee Hills Natural Division, an area characterized by rolling hills, ravines, limestone and sandstone bluffs, caves, sinkholes, and rock-bottom streams (Schwegman, 1973). Prior to European settlement, the Shawnee Hills supported oak (*Quercus* spp.)-hickory (*Carya* spp.) forest (Leitner and Jackson, 1981). The Shawnee Hills is now a mix of deciduous forests, pine plantations, grasslands, croplands, orchards,

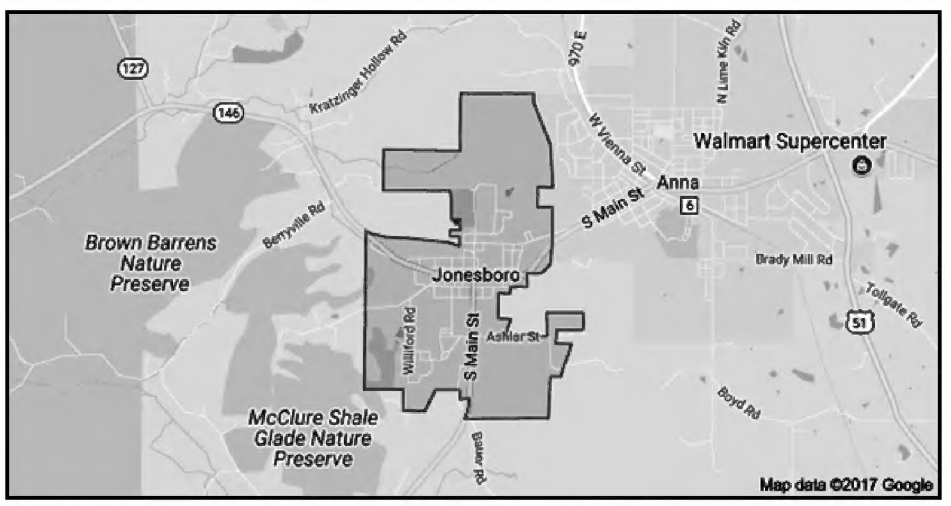

Figure 1. City limits of Jonesboro, Union County, Illinois (Source: Google maps).

active and former coal strip mines and rock quarries, roads, and human-constructed structures.

Jonesboro is bordered to the east by the larger city of Anna, and a mix of agricultural and forestland to the west, south, and north. Human-made structures within Jonesboro city limits include fixed and mobile residential houses, and commercial and municipal buildings. Potential herpetofaunal habitat within city limits includes grass-dominated lawns and fields; buildings (especially decayed stone or cement foundations); croplands; woodlots; narrow, forested riparian corridors; intermittent, rocky streams; shallow drainage ditches; human-made ponds; and naturally-formed sinkholes. Jonesboro receives an average of 127 cm of precipitation annually, and mean monthly air temperature ranges from a low of 0.8 °C in January to a high of 25.3 °C in July (isws.illinois.edu). Elevation within Jonesboro city limits ranges from approximately 140 to 200 m above sea level.

I observed amphibians and reptiles in Jonesboro, where I reside, from 19 April 1996 through 28 December 2017. I made opportunistic observations while walking or driving throughout the community, but most frequently in the residential areas along East Heacock Street and North Main Street. I made additional observations on my property or while walking on a foot-trail around a 0.44-ha impoundment pond in Lincoln Memorial Picnic Ground (LMPG), a U.S. Forest Service municipal park. I also made observations while studying Eastern Spadefoot (*Scaphiopus holbrookii*) breeding activity at a naturally-formed sinkhole that collects and holds water after heavy or prolonged rain events (Palis, 2012, 2016). I collected herpetofaunal observations both diurnally and nocturnally. I qualitatively recorded both visual and aural observations of amphibians, and I quantified all reptile observations except for those of Snapping Turtles (*Chelydra serpentina*), Painted Turtles (*Chrysemys picta*), and Red-eared Sliders (*Trachemys scripta elegans*). For on-road observations, I recorded whether the animal was alive-on-road (AOR) or dead-on-road (DOR). Taxonomy follows Crother (2017) except for my preference for *Rana* over *Lithobates* (Yuan et al., 2016).

Results and Discussion

I detected 26 species of amphibians and reptiles within the city limits of Jonesboro from 19 April 1996 through 28 December 2017, comprising one salamander, 11 frogs, five turtles, two lizards, and seven snakes (Table 1). I also observed two addi-

Table 1. First and last year and number of amphibian and reptile detections in Jonesboro, Union County, Illinois.

	Species	Year first detected	Year last detected	Number of detections
Amphibians	**Salamanders**			
	Eurycea lucifuga	2017	2017	1
	Frogs			
	Acris blanchardi	1996	2017	multiple
	Anaxyrus americanus	1996	2017	multiple
	Anaxyrus fowleri	2013	2017	multiple
	Hyla chrysoscelis	1996	2017	multiple
	Hyla cinerea	2010	2010	1
	Pseudacris crucifer	1996	2017	multiple
	Pseudacris triseriata complex	2008	2016	multiple
	Rana catesbeiana	1996	2017	multiple
	Rana clamitans	1996	2017	multiple
	Rana sphenocephala	1996	2017	multiple
	Scaphiopus holbrookii	1996	2017	multiple
Reptiles	**Turtles**			
	Chelydra serpentina	1998	2017	multiple
	Chrysemys picta	1996	1999	multiple
	Sternotherus odoratus	1996	2016	multiple
	Terrapene carolina	1996	2017	51
	Trachemys scripta	1996	2017	multiple
	Lizards			
	Plestiodon fasciatus	1996	2017	18
	Plestiodon laticeps	2004	2017	18
	Plestiodon sp.	1996	2017	17
	Snakes			
	Coluber constrictor	2008	2017	3
	Lampropeltis nigra	2012	2017	2
	Lampropeltis triangulum	2007	2008	2
	Nerodia sipedon	1996	2013	6
	Opheodrys aestivus	1998	2014	7
	Pantherophis spiloides	1996	2017	28
	Thamnophis sirtalis	1996	2017	59

Figure 2. Cave Salamander (*Eurcyea lucifuga*) from Union County, Illinois.

tional species, Wood Frogs (*Rana sylvatica*) and Eastern Newts (*Notophthalmus viridescens*), in a small fishless pond 60 m beyond the city limit.

Amphibians:

During a morning walk on 5 November 2017, I encountered an adult Cave Salamander (*Eurycea lucifuga*; Figure 2) crushed on a road. The salamander was likely active the previous evening during rain. A sinkhole, approximately 140 m from the road-killed salamander, may provide suitable habitat. This sinkhole has a creviced limestone floor which could permit Cave Salamanders to move between surficial and subterranean habitats.

Two bufonids inhabit Jonesboro: American Toads (*Anaxyrus americanus*) and Fowler's Toads (*Anaxyrus fowleri*). Of the two, I have encountered American Toads across a greater number of months and for a longer period of time (Tables 1 and 2). I did not detect Fowler's Toads until 2013 when I first heard males vocalizing at the LMPG impoundment pond. I lived within earshot of the LMPG impoundment pond in 1996 and 1997, so Fowler's Toads may have colonized the impoundment sometime after 1997. During the breeding season, male Ameri-

Table 2. Monthly observations of amphibians and reptiles in Jonesboro, Union County, Illinois, 1996–2017.

		Month											
	Species	J	F	M	A	M	J	J	A	S	O	N	D
Amphibians	**Salamanders**												
	Eurycea lucifuga											X	
	Frogs												
	Acris blanchardi				X	X	X	X	X	X	X		
	Anaxyrus americanus			X	X	X	X	X	X	X	X	X	
	Anaxyrus fowleri					X	X	X	X	X			
	Hyla chrysoscelis	X	X	X	X	X	X	X	X	X	X	X	
	Hyla cinerea						X						
	Pseudacris crucifer	X	X	X	X	X	X			X	X	X	
	Pseudacris triseriata complex			X	X	X							
	Rana catesbeiana			X	X	X	X	X	X	X	X	X	
	Rana clamitans				X	X	X	X	X	X	X	X	
	Rana sphenocephala		X	X	X		X	X	X	X			
	Scaphiopus holbrookii	X		X	X	X	X	X	X	X	X		
Reptiles	**Turtles**												
	Chelydra serpentina	X			X	X	X	X					X
	Chrysemys picta		X			X							
	Sternotherus odoratus					X	X						
	Terrapene carolina				X	X	X	X	X	X	X		
	Trachemys scripta	X	X	X	X	X	X	X	X	X	X	X	X
	Lizards												
	Plestiodon fasciatus					X	X	X	X	X	X		
	Plestiodon laticeps				X	X	X	X	X	X			
	Snakes												
	Coluber constrictor								X				
	Lampropeltis nigra					X			X				
	Lampropeltis triangulum						X		X				
	Nerodia sipedon				X	X		X					
	Opheodrys aestivus						X		X	X			
	Pantherophis spiloides					X	X	X	X	X	X	X	
	Thamnophis sirtalis				X	X	X	X	X	X	X	X	

can Toads vocalize from a variety of water bodies including impoundment ponds, road-rut pools, and an in-ground swimming pool. I often encounter toads on roads, many of which have been crushed by vehicles. Juveniles of both species have appeared in my yard which is 0.5 km from the nearest impoundment pond.

Hylids detected within the Jonesboro city limits include Blanchard's Cricket Frogs (*Acris blanchardi*), Cope's Gray Treefrogs (*Hyla chrysoscelis*), Green Treefrogs (*Hyla cinerea*), Spring Peepers (*Pseudacris crucifer*), and Trilling Chorus Frogs (*Pseudacris triseriata* complex). Blanchard's Cricket Frogs inhabit impoundment ponds and I detected them within city limits during the entire study period, including at my residence. Cope's Gray Treefrogs appear to be abundant in Jonesboro; I have records for all months except December and have observed individuals during the entire survey period. I hear males vocalizing ("rain calls" from trees and breeding calls from water bodies) during the warmer months. In-ground and above-ground swimming pools attract vocalizing males, and eggs are deposited in these pools when owners neglect chlorine application. I do not know, however, whether any of these in-pool breeding events result in juvenile production. Cope's Gray Treefrogs bred in a 91.4-cm diameter, 17.8-cm deep, blue-plastic child's swimming pool I placed in my yard in 2016 and 2017. I observed emerging metamorphs in 2016, but not in 2017 when three Bullfrogs (*Rana catesbeiana*), and one Green Frog (*Rana clamitans*) colonized and inhabited the pool. I heard a single Green Treefrog vocalize at the LMPG impoundment pond on 11 June 2011. The brief appearance of this species in town is perplexing; the frog may have been inadvertently transported to Jonesboro on a vehicle (Herman, 2014) or by some other means. Spring Peepers are active January through June, as well as in autumn. Prior to 2013, I heard large choruses of Spring Peepers at the LMPG impoundment pond every spring, as well as smaller choruses elsewhere. In spring of 2011, the USFS drained and re-constructed the LMPG impoundment pond and stocked it with fishes (*Ictalurus* sp. [catfish], *Lepomis* sp. [sunfish], *Micropterus salmoides* [largemouth bass], and *Pomoxis* sp. [crappie]) after it refilled. The number of Spring Peepers calling at the LMPG impoundment pond has since steadily declined to zero. I heard one Trilling Chorus Frog vocalize from a sinkhole pond in 2008 and, in 2016, I heard a single male call from an in-ground swimming pool and up to three males call in a small pond 60 m beyond city limits. The pond outside city limits may be the source of males occasionally heard vocalizing within town.

Eastern Spadefoot males vocalize from two locations within Jonesboro city limits. The population breeding within a sinkhole pond is the subject of an ongoing long-term study of the breeding activity of the species, the first 17 years of which are summarized by Palis (2012). I have observed surface-active Eastern Spadefoots in all but three months (Table 2).

Three ranids, including Bullfrogs (Figure 3), Green Frogs and Southern Leopard Frogs (*Rana sphenocephala*), inhabit Jonesboro. Bullfrogs and Green Frogs inhabit impoundment ponds and call during warm months. I have observed all three species during the entire survey period, with species-specific

Figure 3. Bullfrog (*Rana catesbeiana*) from Jonesboro, Union County, Illinois.

activity periods ranging from February through November (Table 2). I have also observed individuals (principally juveniles) of all three species in my yard. Even though I heard Southern Leopard Frogs chorusing at the LMPG impoundment as recently as 2016, I have not detected metamorphs there since 2012. Predatory fishes inhabiting the pond may be inhibiting successful Southern Leopard Frog reproduction by preying upon tadpoles (Werschkul and Christensen, 1977; Gregoire and Gunzburger, 2008). In March 2016 and 2017, I observed Wood Frogs in a small pond 60 m beyond the city limits. In March 2017, I also detected Central Newts within this pond. Both species are capable of long-distance movements (Healy, 1975; Berven and Grudzien, 1990) and, therefore, may occur within Jonesboro city limits.

The occurrence of populations of aquatic-breeding amphibians within an area is dependent upon the presence of suitable aquatic habitats. Amphibian breeding habitat within Jonesboro city limits includes impoundment ponds, a sinkhole that occasionally holds water, a forested ephemeral pond, intermittent streams that annually dry to isolated pools, and above-ground and in-ground swimming pools. For most amphibian species inhabiting Jonesboro these water bodies, except swimming pools, likely contribute to self-sustaining populations. Cope's Gray Treefrogs may, on occasion, produce progeny in swimming pools. Because in-town detections of Trilling Chorus Frogs are limited to one individual each in two widely separated years, the infrequent occurrence of this species in Jonesboro may be dependent upon habitat outside city limits. The single Green Treefrog observation likely represents a waif individual.

Reptiles:

Southern Illinois aquatic turtle assemblages are typically dominated by Red-eared Sliders (Dreslik et al., 2005; Bluett et al., 2011). Red-eared Sliders can be abundant in urban areas, even beyond their natural range limits (Lambert et al., 2013). I commonly observed Red-eared Sliders (up to 26 per visit) active throughout the year (Table 2) at the LMPG impoundment pond during the entire study period. Red-eared Sliders were the most frequently encountered aquatic turtle on roads. On-road obser-

Figure 4. Eastern Box Turtle (*Terrapene carolina*) from Jonesboro, Union County, Illinois.

vations were comprised principally (75%) of hatchlings. I observed hatchlings on roads (2 AOR, 10 DOR) from March through May, as well as in September.

Snapping Turtles were the second most frequently observed aquatic turtle species; I encountered them in several different water bodies including the LMPG impoundment, a permanent-water pool in an intermittent stream, and a temporarily inundated sinkhole. I observed adult and juvenile Snapping Turtles in winter and summer during most of the survey period (Tables 1 and 2). Three individuals were encountered on-road, all crushed by vehicular traffic. I saw very few Painted Turtles, all in the LMPG impoundment pond, and only in the 1990s (Table 1). Painted Turtles may inhabit uninvestigated, inaccessible Jonesboro impoundments. I observed three adult Eastern Musk Turtles (*Sternotherus odoratus*) in the LMPG impoundment pond, two in 1996 and one in 2016. Eastern Musk Turtles are highly aquatic and often overlooked, even when abundant (Mitchell, 1988).

I observed active Red-eared Sliders, Snapping Turtles, and Painted Turtles during mild winter weather in January and February at the LMPG impoundment pond. Cagle (1950) observed Red-eared Sliders in southern Illinois basking in all months except January. I also observed sluggish Red-eared Sliders and Snapping Turtles active under the ice when the LMPG impoundment pond was completely ice covered.

I tallied 51 Eastern Box Turtle (*Terrapene carolina*; Figure 4) observations from 1996 through 2017; 22 on roads (7 AOR, 15 DOR). Box turtles were active from April through October. In addition to 20 observations of adults and juveniles, I observed two hatchlings in my yard. Despite their susceptibility to road mortality and lawn maintenance equipment, Eastern Box Turtles can co-occur with humans in cities (Brisbin et al., 2008; Grant et al., 2011; Rivas et al., 2014). Budischak et al. (2006), however, noted that Eastern Box Turtles inhabiting urbanized landscapes can suffer high mortality rates. I am not aware of Eastern Box Turtle mortality due to lawn mowing in Jonesboro, but on 30 April 2012, I pushed a gas-powered lawn mower over an unseen hatchling that, fortunately, was below the level of the circulating blade. Vehicular traffic, however, does takes a toll, as 29.4% of my Eastern Box Turtle observations were road-kills.

I observed two lizard species in Jonesboro: Common Five-lined Skinks (*Plestiodon fasciatus*) and Broad-headed Skinks

Figure 5. Broad-headed Skink (*Plestiodon laticeps*) from Jonesboro, Union County, Illinois.

(*Plestiodon laticeps*). The majority (86.6%) of observations of both species of skinks occurred in my yard, especially near my house and garage. Because Common Five-lined Skinks and Broad-headed Skinks (Figure 5) are superficially similar, I did not assign an individual to species unless I captured and carefully examined it. I relied on counts of supralabial and postlabial scales to determine species (Powell et al., 2016). I tallied uncaptured individuals as *Plestiodon* sp. I encountered Common Five-lined Skinks during the warmer months during the entire survey period (Table 2). I did not capture and positively identify Broad-headed Skinks until 2004. I frequently encountered juveniles of both species, indicating the presence of breeding populations.

I observed seven snake species in Jonesboro. Eastern Garter Snakes (*Thamnophis sirtalis*; 53 adults and six juveniles) were frequently encountered and were observed during the entire survey period. These results are not surprising because Eastern Garter Snakes (Figure 6) are often encountered in human-inhabited environments (Conant, 1938; Grant et al., 2011; Gibbons, 2017). I found 27 Eastern Garter Snakes on roads, 26 of which were dead. Other sources of mortality/injury included lawn mowing (N = 1) and predation (two snakes, still alive when found, exhibited puncture wounds. One of the wounded snakes was accompanied by a domestic cat). Four individuals were observed up to 1.5 m above ground in vegetation or on chain-link

Figure 6. Eastern Garter Snake (*Thamnophis sirtalis*) from Jonesboro, Union County, Illinois.

Figure 7. Local resident surprised by presence of a Gray Ratsnake (*Pantherophis spiloides*) wrapped around a gazebo support in the Lincoln Memorial Picnic Ground, Jonesboro, Union County, Illinois.

fences. I observed Eastern Garter Snakes from April through November.

I detected 28 Gray Ratsnakes (*Pantherophis spiloides*) throughout the study period, 10 of which were juveniles. I observed 20 individuals on roads (1 AOR, 19 DOR), five aboveground in trees or on human-made structures, and three on the ground. I encountered Gray Ratsnakes from May through November. Road mortality was high (67.8% of all observations). The remaining five snake species were encountered much less frequently (Table 1). I observed three (2 adult [1 DOR] and one neonate) North American Racers (*Coluber constrictor*), two DOR adult Eastern Black Kingsnakes (*Lampropeltis nigra*); 2 DOR adult Red Milk Snakes (*Lampropeltis triangulum syspila*), six adult Common Watersnakes (*Nerodia sipedon*), and seven (6 DOR) adult Rough Green Snakes (*Opheodrys aestivus*). I observed one live North American Racer near an unkempt area behind a grocery store and the other in LMPG. Northern Watersnakes were associated with water bodies and the live Rough Green Snake was encountered in my yard.

Gray Ratsnake observations greatly outnumber those of the other large-bodied snakes inhabiting Jonesboro (North American Racer and Eastern Black Kingsnake). These species have similar food habits and populations of birds and small mammals appear sufficient to support populations of all three species in Jonesboro. Differences in biology may account for the disparity in detections among these three species. In southern Illinois, Gray Ratsnakes are more arboreal and more sedentary than North American Racers (Carfagno and Weatherhead, 2006; 2008). As a result, Gray Ratsnakes may be more likely to maintain a population among humans because they are less likely to attract attention (Figure 7) and, therefore, may be less vulnerable to malicious killing than North American Racers. Eastern Black Kingsnakes are highly fossorial and often use small mammal burrows as subterranean habitat (Steen at al., 2010; Howze and Smith, 2012). Thus, they may be less likely to be detected by humans than Gray Ratsnakes.

Summary

Living in town, with its network of roads, can be perilous for herpetofauna and my observations indicate that numerous amphibians and reptiles are killed on Jonesboro roads annually. Other anthropogenic sources of mortality such as maintenance of lawn turf and liberation of pets outdoors may also take a toll on Jonesboro herpetofauna (Loss et al., 2013; Rivas et al., 2014). In addition, many people dislike snakes and kill them on sight (Conant, 1938; Dodd, 1987; Langley et al., 1989; Ashley, et al., 2007). Nonetheless, I detected 26 species of amphibians and reptiles in Jonesboro, many of which may be capable of maintaining self-sustaining populations within the city limits. My observations suggest that small rural human communities can provide suitable habitat for amphibians and reptiles and, therefore, may be valuable for maintaining herpetofaunal diversity at the landscape level.

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Flipping Pages: Appreciations of Herpetological Literature
Snakes and Snake Hunting (1957) by Carl Kauffeld

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Is anyone who's kept snakes unfamiliar with the term "Okeetee Corn"? The spectacularly beautiful Corn Snakes from the area around the Okeetee Hunt Club in South Carolina are probably the most prized natural forms of this species. My introduction to this snake was in "The Saga of Sandy Hill," chapter 11 of this herpetological classic by Carl Kauffeld. My infatuation with this species hatched because of his account. Kauffeld's book was unlike any book about snakes I had read before. Its appeal is no mystery: it is a detailed first-person account about finding and capturing snakes. In the "Forward," Kauffeld tells readers he wants them to "relive" with him "scenes of the chase," and that is exactly what he does. For my 11-year-old self, it was account after account of finding and catching the animals I had only read about. Kauffeld describes the tools of the trade: a grass whip with the blade removed (my dad had one, with which I absconded), cloth bags (I mastered the sewing machine in my dad's tailor shop by making my own bags), and boots. Alas—even with this splendid equipment, I did not enjoy success like Kauffeld's.

My own limited snake-hunting experiences as a boy, though, mirrored Kauffeld's own as narrated in "Gamy Garters, Wary Waters, and Menacing Moccasins" (okay: not the Moccasins). My snake hunting in Minnesota had yielded a few garter snakes, and family trips to the northern panhandle of West Virginia allowed me to catch a few Northern Water Snakes. Kauffeld's first snake hunt resulted in a DeKay's (Northern Brown) Snake and two Garters. His advice in the chapter about leaving no stone unturned when hunting snakes is one that I have followed as gospel. And his experience of having his first three snakes escape the night of their capture is one that, alas, I too have experienced.

Kauffeld's descriptions of catching snakes usually take longer to read than (in my experience) it actually takes to catch most snakes. This is because he is careful to describe each snake's behavior. His account of catching an Eastern Diamondback Rattlesnake illustrates a behavior that the species exhibits elsewhere in the book: "Maneuvering backward and away from us, yet always turned toward us with head poised for the forward thrust from the S curve of the neck and body—rattling furiously—the angry reptile made long lunges at us each time we approached." In describing his experiences with Cottonmouths, Kauffeld cites what he calls the Harvard Law of Animal Behavior: namely, "'under perfectly controlled conditions, *animals behave as they damn well please!*'" He illustrates this with examples of (more "Kids: don't try this at home!" stuff) Cottonmouths not striking when given the opportunity. In another note on snake behavior, Kauffeld writes, "If all the rattlesnakes I've known who failed to rattle were laid end to end, they'd make a chain possibly a mile long." And even in my limited experience as an 11-year-old, I could verify the truth of this observation: "Garter Snakes enjoy a reputation for docility, which is quite undeserved . . . [T]hey are vile-tempered and bite and chew savagely once they have secured a grip with their small sharp teeth, causing a wound which is harmless but bleeds alarmingly for a few moments."

Kauffeld's ability to describe the snake in terms of its place in the landscape helped me gain an appreciation not only for the snake in its habitat but also for the habitat itself. The descriptions were, to my 11-year-old mind, evocative of the remote and exotic: "Raulerson's orange grove was situated in the heart of a jungle hammock—a setting more lovely than any grove I have ever seen. The trees were heavy with large fruit yet they were in full blossom too. The fragrance of such a grove is almost indescribable and the taste of that fruit was also indescribable." In the chapter "Huachuca Heaven," Kauffeld's camp site "would have delighted any naturalist. The mournful cooing of Inca and White-winged Doves was a sound heard continually . . . The stars, because of the clear, rarified air, seem closer and shine more brightly than elsewhere." Later in the same chapter, describing the capture of a Black-tailed Rattlesnake, Kauffeld writes, "I stopped to take a drink . . . The water was so cold it hurt my teeth. Could this be Arizona? . . . [T]he illusion of being in some shady glen in the Berkshires or Catskills was undeniable. Tall trees all about permitted the sun to shine through only in meager patches."

Although the book's major appeal to me when I was a boy was Kauffeld's accounts of finding and capturing snakes, I find it is Kauffeld's musings on conservation that interest me now. An entire chapter, "Memories of Mount Misery," echoes my own experiences in the Chicago region. Many of the locations where I found snakes and other herptiles, often in numbers, 30 years ago or so, are gone. At Mount Misery, the Civilian Conservation Corps essentially destroyed a rattlesnake den; Kauffeld writes, "Whatever social and economic value the work of the CCC may have had, its presence was often inimical to the interests of naturalists" and "[I]ts activities belied the use of the word 'conservation' in its title." Many of the areas I surveyed in the 1980s and early '90s were destroyed by the construction of I-355. Others were destroyed by the forest preserve districts as they cleaned up trash piles and removed barns, "restoring" areas that served as hunting grounds and hibernation sites for Fox, Milk, Brown, and Garter Snakes, as well as Tiger Salamanders, American Toads, and the occasional Eastern Newt.

So, despite the decades since its publication, *Snakes and Snake Hunting* remains relevant on several levels. First, it is an antidote for the winter blues, when finding snakes around Chicago is four months off; second, it provides insights into the natural history of many snakes; third, it describes the tools and techniques to safely (well, as safely as possible) capture and handle snakes; and finally, it advocates for an appreciation of snakes and the natural world that they inhabit.

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Chester and the Hag

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One of the intricacies of picking off individual people to write about is the way their stories seem to intertwine. Visualize closely associating with a tight group of over 50 people over a 26-year period, and then choosing one or two here and there to write about. One way to document those one or two would be to tell the whole "big story" of all 50 people in chronological order. Eventually, the story of those one or two people will emerge. Or, one can ignore the big story of the 50, and simply go for the layer of the whole story that encompasses the one or two people that one wishes to highlight. In either case, going to the origins is the best route to take. How did these people first come into the story?

As it is with people, so it is with rattlesnakes. These columns were at one point fairly close to becoming a blow-by-blow narration of the history of the 15-year herpetological radio-telemetry study that came to be known as "The Suizo Project." The Suizo Project actually began over eight years before the 15 years of the telemetry. Said eight years of temporal depth began with my initial visits to a place that we have named Iron Mine Hill. And the Suizo Project continues to this very day. I am still fiddling about on Iron Mine Hill *after* the 15 years of telemetry that followed the eight unplugged years. Now that I no longer rely on batteries, electronics, and sure scientific recognition of individuals, I will continue to just fiddle about for as long as I can keep going out there. It is my hope that the Suizo Project will continue after my death, but my black crystal ball keeps coming back with "Reply hazy try again" when questioned about any details of my afterlife. That's right—I have based my life on that wise oracle, the Magic 8-Ball. The six bucks that I shelled out for mine in the 1960s have been paid back in full many times over.

A wise man once wrote "As it is with people, so it is with rattlesnakes." I wish I knew that man's name, and when he said it, so that I could quote him properly. Oh—that was me—just now! Brilliant! The social complexity of the life of rattlesnakes does indeed stack up favorably with that of their human counterparts. Their tales *do* intertwine. We are about to unravel the story of two rattlesnakes by going to their origins in the study. As for taking on the story of all the rattlesnakes of the Suizo Project on a chronological basis, from the beginning, and laying it out there in a monthly fashion until the end—forget it! It would take a year of columns just to describe the first week—and we now have 26-plus years to relay. It is a good strategy to go for the best events as they come to mind, leave the minutia out, and *try* to stop grinning when I consider how many other cool rattlesnake stories pop up as just one is being relayed.

Getting back to intertwining tales, the story of Chester and the Hag begins with intertwining tails. We have spoken often of Dr. Gordon Schuett in these columns. We have said enough about him that we will say no more, except for the fact that back in 2002, Gordon snagged two neonate female Western Diamond-backed Rattlesnakes (*Crotalus atrox*) from their nest site. That's right—the dickhead took two baby *atrox* from their mother. Said mother was greatly revered by me. I had named her after my own sweet mother (***for krissake!***). Gordo unceremoniously whisked those two babies away from her loving embrace. This author was present when it happened, and this author was not happy about it. Three years later, Gordon wanted to release these same baby *atrox* back into the wild, and radio-track them. This author was not happy about *that* either. The whole mess is mysterious in the ways of snakes, gods and Gords. But that is another story, already told in one place—perhaps to be told again in a future article elsewhere. For now, it is enough to know that on 7 September 2005, the two natal *atrox* that Gordon had removed from the wild three years previous were returned—to the exact spot they came from. They were now no longer baby rattlesnakes, but sexually mature adults. The good Dr. Schuett *knows* how to raise a healthy snake. On this fateful day, two very healthy, young and reproductively ripe virgin female *atrox* were placed in the thick of *atrox* central, right in the middle of their mating season. It was like ringing a dinner bell in front of starving orphans. Needless to say—woohoo—the boys' primeval hormonal responses were in working order, and said boys came a runnin'! With the first tracking session, which occurred three days later, each of our virgins had pulled in a boyfriend.

As both Gordon and I were at one point (in our younger lives, of course), familiar with *Hustler* magazine, we named these two male snakes "Chester," after . . . well, never mind about that. (Goodness gracious—how did they *ever* get away with that? It sure wouldn't fly today!). So, we had two Chesters with their tails wrapped around our young offerings, and the tale that follows will be about the one we called Chester number 2. He was also known as *Crotalus atrox* number 97, or "Ca97." Both Chesters received transmitters, and were placed back with their girlfriends as quickly as we could make it happen. We are now done with the virgin female part of this intertwining tail tale. We are also done with Chester number 1. Any further discussion about Chester in this column is about the Ca97 Chester.

Just over a year BC (Before Chester), on 26 June 2004, Ca64, "the Hag," entered the study. She came along at a time when we were ramping up in an almost out-of-control fashion with our study. We had transmitters to burn, and were putting them in all comers—especially the females. As her name implies, the Hag was an elderly snake, who had a predisposition for hanging out in the densest stands of miserable and impenetrable desert hackberry. This grew frustrating, especially since we were dealing with a snake we knew was pregnant. She gave birth to her litter somewhere in the center of a 3-meter tall by 5-meter diameter hackberry thicket, leaving us without so much as a glimmer of the technical aspects of her reproduction. She was another of those pregnant snakes who was documented as going

Figure 1. Note the flat rock slab in lower right corner with the word "HAG" boldly labeled upon it. This is where the Hag overwintered in 2004–2005. Just upslope of this, note the letters "AD8." This is an aggregate den that Chester led us to in the winter 2005–2006. "She could have easily finished the journey, and overwintered in the comfortable and roomy confines of *atrox* den number 8, AKA 'AD8'." See text for details. Image by the author.

in fat, coming out thin—end of *that* story, period. At first, we were calling her the "Hackberry Hag," but her name was eventually shortened to "the Hag." By mid-October of 2004, she climbed out of the hackberry thickets at the north base of Iron Mine Hill to the coldest nether-regions on the northeast side of the hill. She crawled under a flat rock barely large enough to give her shelter, and overwintered there. It seemed like an odd place for her to stay—especially after we learned that this flat rock was a 30-second crawl upslope to an *atrox* den that Chester would lead us the following year. She could have easily finished the journey, and overwintered in the comfortable and roomy confines of *atrox* den number 8, AKA "AD8" (Figure 1). Were this author allowed to read more into her actions than is remotely possible, he might even speculate that she purposefully chose not to go there. If *atrox* are capable of reason, there would be plenty of reasons to hide AD8 from the keepers of the virgins.

And now we fast forward ahead to the late summer of 2005. The Hag left her tight winter lodgings over six months previous. Chester has been caught with his pants down, so to speak, but is on the crawl again. The Hag is now prowling the hackberry thickets at the bottom of Iron Mine Hill. She is putting on some mass, and looking for love again. Meanwhile, Chester has decided that there is no such thing as free love with the keepers of the virgins, and he flees his lady love as soon as he is set beside her. She is nothing but trouble, and he gets as far away from her as he can. He puts over 500 meters between himself and her during his first week in the study. As he is fleeing from her, he is moving toward the Hag, who in turn finds a dandy of a boyfriend. On the cool morning of 8 October, she is photographed crawling out of a prickly pear and coiling beside the heftiest male *atrox* to ever enter our study. The future Ca98, "Goliath," measured out at roughly 44 inches, with a mass just under two pounds. He is coiled and sleeping like a big baby on open ground as the Hag snuggles beside him. The resulting image is my personal favorite photo of an *atrox* pairing. The image has a lot going on in it. The eyes of the male are rolled downward, indicating that he is probably sleeping. The fact that he isn't reacting to three of us looming large above him is another indicator that he is out cold. The most interesting aspect of the image is that the Hag is obviously crawling out of her prickly pear hangout to join him. Her actions seem to indicate a willingness to participate in whatever is to follow. "Wake up, big boy—mamma wants to play!" (see cover image).

A week later, Goliath was back in the game with a new transmitter. He had learned to never trust older women again—especially those under the watch of the keeper of the virgins. Meanwhile, Chester was sliding along the ridgeline above the Hag. The fact these two snakes were now less than 50 meters apart was highly advantageous for documenting the events that followed. We had too many children to visit with every tracking session. But we had learned to use the location of each animal to our advantage, so that we could mow down as many as possible with the least amount of hiking. Hence, for the next several months, any time that we tracked the Hag, we tracked Chester. What developed between these two snakes took our understanding of pair bonding well beyond the limits of anything ever documented with rattlesnakes. But they were not together yet. By 12 November 2005, Chester slipped into the north side of a massive rock shelf, roughly 2.5 meters tall by 8 meters in diameter. The formation that he selected was absolutely infested with crevices and deep, cavernous (for a snake) openings. We found a new male *atrox* coiled just outside this formation the same day. Any time that two or more snakes occupy the same boulder formation in mid-November, the odds that said formation is an aggregate den are very great. We may have jumped the gun a bit by immediately assigning *atrox* den # 8 (AD8) to this structure, but AD8 soon proved itself worthy of the designation. One other event that occurred on this day was an alert notation on the datasheet about AD8's location: "Lower NE slope of hill, close to Ca64's (the Hag's) overwintering site." (See Figure 1 again.) This was the first indication we had that the pair might know each other.

The fall of 2005 was not kind to our plot weather-wise. The spring rains had been so refreshingly plentiful that I maintained high hopes the summer rains would bring on a banner year. But they didn't. They fizzled. September was scorching hot and dry, and a complete lack of measurable moisture continued into March of 2006. Unbeknownst to me initially, the Hag was also beginning to fizzle. Rather than moving back toward AD8, she remained in the boulder fields at the base of Iron Mine Hill. On 26 November, we had a good look at her, and she was terribly thin. I took some images of her, but did not really take the time to examine these images carefully. Had I done so, I would have noticed a nasty, pimple-like protrusion protruding outward from under the skin near her throat (Figure 2). Yup, it was a nasty ass zit for sure—in a very bad place. At this point, the Hag was at the gates of Odin, heading for whatever crotaline Valhalla is the just reward for a female *atrox* like the Hag. *Crotalus atrox* heaven is probably a nice place, but the black flag had not yet risen for the Hag in this life. The keepers of the virgins may taketh away, but they also giveth back when needed. But at this point, things were not good for her. The drought and that nasty zit were killing her, and those who giveth back were as yet

Figure 2. The Hag, not looking so good. While the "killer zit" highlighted by the arrow appears obvious, it went unnoticed by us for over two months. One week after this image was taken, Chester left his aggregate den (AD8), and traveled 52 meters to visit her here. See text for details. Image by the author, 26 November 2005.

unaware of the problem.

We may not have been aware of the problem, but Chester seemed to know that something was amiss. Between 3 and 10 December, he moved 52 meters downslope from AD8 to join her. The Hag was still at her 26 November location when he did. Chester's move was so unexpected that when we first looked for him that day, we automatically headed up the slope to AD8 with the receiver turned off. Once we got there, the receiver was turned on—which was a big help in getting it to function properly. The signal led us right back down the hill to the Hag's doorstep, so to speak. We couldn't see the Hag, who was buried in the rock shelf shown in Figure 2. Chester was also not visible, but the signals clearly indicated the two were together. Eight days later, Chester was back at AD8. We invented the term "ping-pong move" for this kind of site-shifting. It is something that Gila Monsters do often in the early spring season, but this had *never* happened with the *atrox* before—at least not in the late fall. All appeared to be normal with Chester for the remainder of 2005. He remained at AD8. However, the Hag began to shift further from the hill—heading steadily toward the big wash. This was highly unusual behavior on her part, but we still remained ignorant of her plight.

Between 31 December 2005, and 7 January 2006, Chester again plunged down that hill to visit the Hag. This time, he traveled 109 meters from AD8 to find her. She was seen coiled in front of a roughly 60-cm-square chunk of granite, while he was coiled directly behind her in the soil burrow that ran under the boulder (Figure 3). On 14 January, the Hag was still at this boulder, but Chester had jetted back up to AD8—a 109-meter ping-pong move in the dead of winter! And then, one more time! On 21 January, Chester made the plunge back to the boulder to visit her again. This time, neither snake was visible. They were both under the boulder. Her body temperature was a bone chilling 5.4°C, while his was 6.6°C. This is about as cold as the herps under our watch ever got. It is interesting to note that when Chester was in AD8, his body temperature hovered around the 15°C mark. This snake suffered some with each visit he was making to her. He was also taking extraordinary risks by exposing himself to any number of predators with each journey, not to mention the danger of dehydration. Why was he doing this?

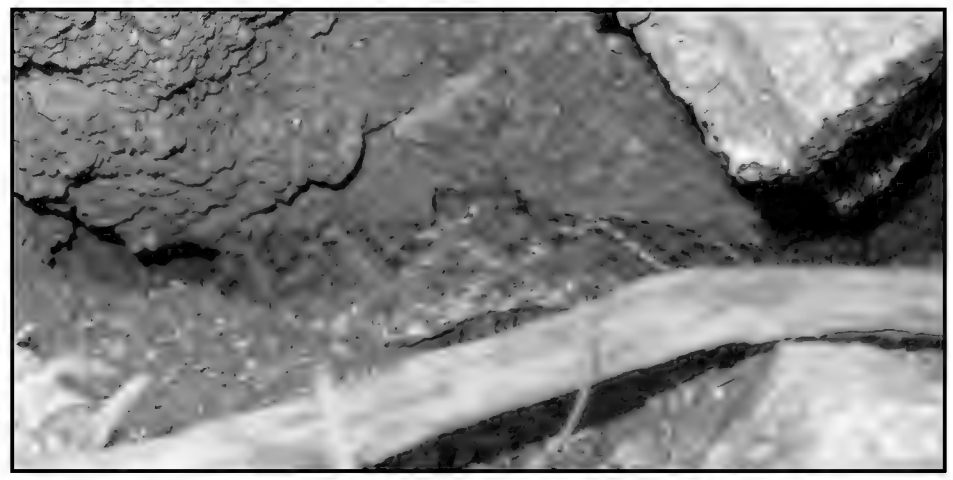


Figure 3. The Hag as viewed on 7 January 2006. Chester was right behind her when this image was taken. He twice moved 109 meters—in the dead of winter—to join her here! Image by the author.

By 28 January, as the reader may guess, Chester was back up at AD8. The Hag remained at her boulder site this day. By 4 February, the Hag had shifted out to a wash island. She was found coiled at the base of a desert broom. Moving back out into the big wash was yet another sign that something wasn't right with her. As it had been over five months since a measurable rain had fallen, I decided to offer her water. I cupped my left hand about a meter above her body, and poured water from my bottle into the cupped hand. By wiggling my fingers some, I was able to sprinkle water over top of her. It was the first attempt to "giveth back" to the Hag. We didn't do this often, but the normal reaction is for the snake to tighten its coils to gather pools of water. The head will then seek out these pools, and the snake will lap up the water with its tongue. At first, she seemed like she was going to try this. But as soon as she tried drinking, she rose into some form of spastic defensive posture and sort of writhed about—as if the act of drinking was causing her great pain. She was trying to drink the water droplets off her flank as she writhed about, but that wasn't working at all. With nothing to keep it in place, the water kept sliding off her body. It was then that I noticed, and noted, her neck blemish. At the bottom right corner of page 19 in our 2006 binder, the following notation occurred: *Ca64 cont'd: Health is very bad, about 50mm down from head, left side of neck, is a ~5mm x 3mm tall protuberance—looks like parasites. Her drinking efforts were pathetic—she did not coil proper to catch the water. We will pull her next week, and nurse her back to health.* (Figure 4).

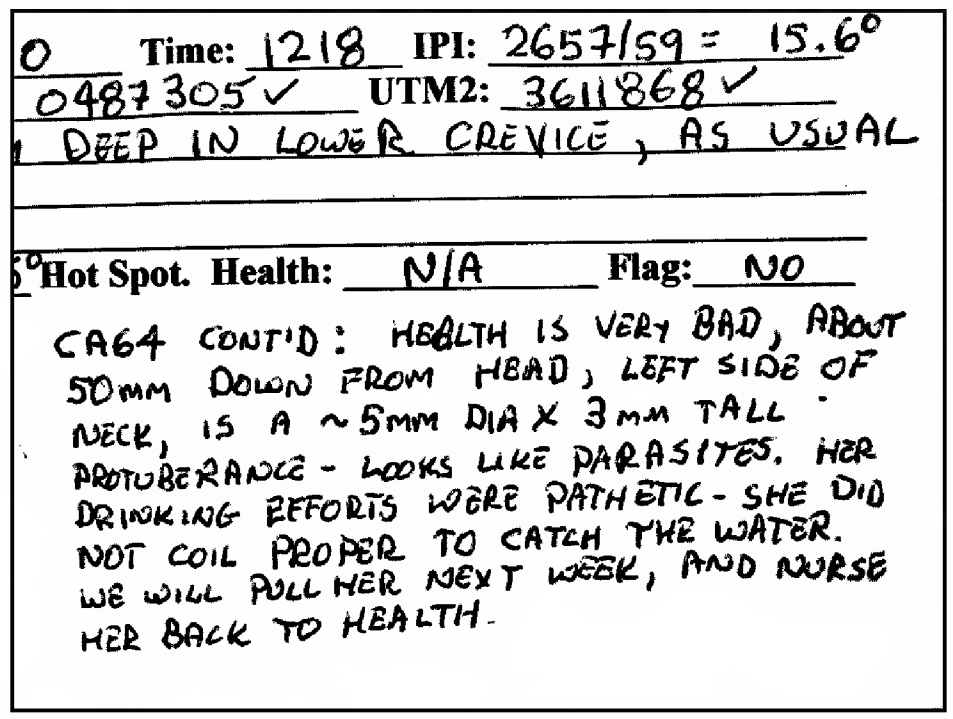

Time: 1218 IPI: 2657/59 = 15.6°
0487305 ✓ UTM2: 3611868 ✓
DEEP IN LOWER CREVICE, AS USUAL
Hot Spot. Health: N/A Flag: NO
CA64 CONT'D: HEALTH IS VERY BAD, ABOUT 50MM DOWN FROM HEAD, LEFT SIDE OF NECK, IS A ~5MM DIA X 3MM TALL PROTUBERANCE - LOOKS LIKE PARASITES. HER DRINKING EFFORTS WERE PATHETIC - SHE DID NOT COIL PROPER TO CATCH THE WATER. WE WILL PULL HER NEXT WEEK, AND NURSE HER BACK TO HEALTH.

Figure 4. Actual datasheet notation of the Hag's poor health, finally noticed on 4 February 2006. As suggested in the notation, she was collected for intervention one week later. Image by the author.

Figure 5. Chester viewed just outside AD8 on 25 March 2006. Chester's tapered rattles suggest him to be a young, prime-of-life male. What a good boy he was—visiting a sick old lady three times during the coldest months of the year. What's up with *that*? Image by the author.

The next week arrived, and so did we. On 11 February Gordon and I tracked her to the exact spot that she was the week before. There were no obvious signs that there was any sort of refuge under the desert broom that she was coiled beneath. It is my guess that she was just staying there 24 hours a day, 7 days a week, waiting to die. True to the promise suggested on page 19 of our datasheets, we collected her, and sent her home with Gordon. Some exploratory surgery revealed that her neck zit was in reality the blunt end of a 30-mm-long cactus spine. Said spine went right through her throat and angled toward her head. It is no small wonder that any effort to drink was causing her pain, and eating would have been impossible. Following the removal of the spine, as well as her transmitter, the good Dr. Schuett lovingly lavished upon the Hag some Kangaroo Rats we had previously gathered from our plot. (We called these frozen K-rats "plot biscuits.") When we released her on 1 April 2006, she was reasonably fat and sassy again. I first checked her PIT tag to make sure all was in order, and then we set her into the same hackberry that she gave birth in. She quickly glided into the middle of it all and disappeared. We never saw her again.

During the time period that the Hag was removed from the game, Chester was a stay at home *atrox*. He remained buried in AD8 until 25 March, when he was viewed and photographed basking in the direct sunlight just outside the northeast facing opening of the den (Figure 5). Two fresh, young female *atrox*, Ca101 and Ca102, were collected from AD8 this day, and implanted with transmitters. In addition to the Hag, he probably knew these two ladies. Now, all three were temporarily out of his life—and he moved out of AD8 and headed into his summer range. The keepers of the virgins were seriously impacting his love life!

I am going to wrap this column up with some statistics, a bold statement, some questions, some speculation, and a quote from my sage veterinarian friend Gery Herrmann. From the years 2002 through 2010, we had 19 different aggregate denning male *atrox* under watch during the winter months. We visited these 19 male *atrox* over 500 times during the months of December and January. Never, and I mean, ***never***-- did any other male *atrox* perform a single ping-pong move during those two months. Chester ping-ponged three times! During the winter of 2005 and 2006, counting Chester, we had 6 male *atrox* at aggregate dens. The other 5 remained home in December and January. The drought during the winter of 2005–2006 was the worst to ever hit our plot. We went 175 days without any measurable rain. During drought years, the *atrox* tend to stay inside the dens, as any exposure to the dry air outside can lead to dehydration. In addition to this, AD8 is the coldest aggregate den on Iron Mine Hill that we know of. The body temps of the snakes inside the den, as well as the general microclimate data of ambient and hot spot temperatures just outside, indicate the whole vicinity to be 5°C below the rest of the dens. Hence, there were no ectothermic reasons for Chester to be moving about. On top of all this, Chester had two fresh young ladies in that den with him. He *surely* must have known they were there?

There is some very strong circumstantial evidence that the purpose of Chester leaving AD8 was to visit the Hag. The fact that he found her in two different locations would indicate that. The Hag's overwintering spot close to AD8 the previous year sets up a very strong possibility that they had met before. The following is the "bold statement" promised one paragraph ago. Yup! I'm stating the obvious here: Chester was visiting the Hag. Does anybody have a problem with that?

If we accept the notion that he was indeed visiting her, it becomes a matter of "why." The first thought to enter the brain of any male horn dog herpetologist is that the sole reason for a male rattlesnake to visit a female is to mate her. While *Crotalus atrox* are blessed with two mating seasons, the timing of these visits encompasses neither. One mating season occurs March through April, the other is September and early October. We can just about bet our bottom dollar that there are no rattlesnakes mating in December and January anywhere in this great country of ours. Hence, mating can't be the reason why in this case. The next most possible explanation one will get from the wise old horn dog herper is that the male rattlesnake wants to keep tabs on the females. They know where they are, they visit them, cotton up to them—all so that the females will inevitably know and mate them in the proper season. "Mate! Mate! Mate!" That's all they think about. At least, that's what the horn dogs are thinking. But what are the rattlesnakes thinking?

OK, so we'll pay homage to these horn dogs. Chester was visiting the Hag as a form of foreplay. This while he had two females in the same rock structure with him—and three others scattered out in the bajada nearby. All five of the other potential mates were healthy females, with way more potential for fornication privileges than the Hag held for him. Good god, the poor Hag couldn't even drink proper. If Chester had any thoughts of mating her, he must have had access to some moisturizing cream. Conditions *had* to be pretty dry down there with the Hag! On top of this, if males commonly visited females in the dead of winter, why did not any of our other males do this through the years? All 19 of them were constantly *surrounded* by bajada-dwelling babes!

In the case of Chester and the Hag, when I try to think like a rattlesnake, every scenario points to concern on the part of Chester for a dying female *atrox*. While this is wild speculation, I can't make any other scenario work in my mind. Why would one rattlesnake be concerned for the health of another? My first thought was that the Hag was Chester's mother. We looked at the DNA, and that said otherwise. While I have no choice but to

accept these findings, I know how easy it is to make a mistake with numbers. We submitted nearly 300 blood samples to be analyzed. If the Hag was not Chester's mother, then what? Was she his first love, or one of his lovers? The older females tend to go for the younger males, so that is certainly possible. If that's not the reason, then what? Were they just friends? Was he trying to maybe guide her back to AD8 with him? While any of these questions may seem ridiculous, there *must* be some reason why these winter solstice visits occurred.

During a recent email discussion between several CHS members, Gery Herrmann made a simple yet profound statement. Said statement went something like: "We (humans) will never be smart enough to know how smart rattlesnakes are." This statement is especially true if we continue to overlook the little glimmers of intelligence that come our way through incidences like the one just described. While I am a big fan of the statement "It ain't science until it is proven," we can never prove anything without first laying out the questions and pursuing avenues that might lead us to the ultimate answers. We can't be afraid to guess, as speculation leads to hypothesis-driven science. We must keep our minds and all options open if we are to answer the almighty and commonly-asked question: "Will we ever know what it's like to be a rattlesnake?"

This here is Roger Repp, signing off from Southern Arizona, where the turtles are strong, the snakes are handsome, and the lizards are all above average.

Minutes of the CHS Board Meeting, January 19, 2018

Rich Crowley called the meeting to order at 7:34 P.M. Board members Lawrence Huddleston, Zac Oomens and Jessica Wadleigh were absent. The minutes of the December 16 board meeting were read and accepted.

Officers' Reports

Treasurer: John Archer read through the financial reports.

Media secretary: Kim Klisiak will work on redesigning the CHS website. For a small monthly fee we could maintain all three of our websites (CHS, ReptileFest and Junior Herpers) on a single hosting service.

Membership secretary: Mike Dloogatch read the list of expiring memberships.

Sergeant-at-arms: There were 27 people at the December 27 holiday meeting.

Committee Reports

ReptileFest: Frank Sladek announced that a planning meeting was set for January 28 at the home of Andy Sagan. Frank has arranged it so that tickets to 'Fest ca be purchased online through Eventbrite.com. The design for the adult T-shirts was passed around. A block of rooms has been set aside at the Best Western in Morton Grove for out-of-towners who need a place to stay.

Junior Herpers: Frank Sladek reported that 35 to 40 people were present at the January meeting. Tom Mikosz spoke about his yellow anacondas. Zac Oomens will speak in February about reticulated pythons.

Nominating committee: Rich Crowley is determined to put together a committee by March.

Grants committee: Eighteen grant proposals were received this year. The committee will meet in mid-February to choose the recipients. Mike Dloogatch moved to allocate funds not to exceed $10,000 for grants in 2018 Dan Bavirsha seconded the motion, which passed unanimously.

Old Business

We are still looking for a venue at which to hold the board meetings.

New Business

Gail Oomens made a motion to remove former treasurer Amy Sullivan as an account signer on the Chicago Herpetological Society bank accounts. Mike Scott seconded. The motion passed unanimously. Past treasurer Andy Malawy will remain as a signer on the accounts.

The Treasure will give our corporate seal to Joan Moore to emboss the library books.

The meeting adjourned at 10:00 P.M.

Respectfully submitted by recording secretary Gail Oomens

Bulletin of the Chicago Herpetological Society 53(2):47-48, 2018

What You Missed at the January Meeting: Ray Pawley

John Archer
j-archer@sbcglobal.net

I suppose there are a few people reading this who don't know Ray Pawley. Here's a brief autobiography that was on the CHS website:

> My City Zoo career began at Lincoln Park when I was hired by Marlin Perkins to supervise the Reptile and Small Mammal houses as well as manage the animals to script for the new "Wild Kingdom" program that was soon to begin. Three years later I became the Curator of Herpetology at Brookfield Zoo, eventually taking on additional Curatorial positions with Birds, Mammals and Public Relations. I was very honored to have served as CHS President in past years. After moving to Arabela, New Mexico, I was Director of the Hubbard Museum of the American West in Ruidoso, Consultant for the Spring River Park Zoo in Roswell, and currently serve as a Judge for the Herpetologist's League's E. E. Williams Herpetology Research Grant (Ecology) which provides funding for competing graduate students. Currently I write zoo, wildlife and herpetology-based articles for Zoo and Herpetology Journals as well as area news media.

I suggest that a thorough search for "Ray Lynn Pawley" (the middle name will filter some of the pretenders) will reveal that this short paragraph inadequately highlights his life, but I'm not going to go into his life any deeper for this article.

Even with as many accomplishments as Ray has, he doesn't stop coming up with new ideas and activities. His January presentation revealed one of his current areas of interest. He titled it "Hibernation: Some Snake Management Insights." He opened with a picture of the door on his barn with a slim vertical glass pane and a logo reading "Rattlesnake Habitat" just above a smaller sign declaring "Beware of Rattlesnakes." I suspect that most of you reading this would take that as an invitation to explore. Inside Ray keeps rattlesnakes, most of which he has relocated from areas where they are threatened by humans. Most are western diamondbacks (*Crotalus atrox*), but he also keeps a couple of eastern black-tailed rattlesnakes (*Crotalus ornatus*) and two bullsnakes *(Pituophis catenifer*). The room is insulated and only the extreme temperatures are controlled, cooling when the temperature gets to 85°F and heating when it drops to 40, but otherwise the room fluctuates with the outside ambient temperature. Ray feels that it approximates the conditions in a typical rattlesnake den for the area. Animals are housed singly in plastic tubs with a water bowl and a hide box and newspaper as a substrate.

Ray Pawley. Photograph by Dick Buchholz.

A door that would be an invitation to explore for many of us. Photograph by Ray Pawley.

Since 2013 Ray has offered food to his snakes nine times from June to September (4 months out of the year). Compared to the feeding schedule used by Brookfield Zoo, the animals ate one-seventh to one-twelfth as much food. The animals are active, healthy and growing. Refer to the chart below for the results.

SPECIMENS:	C. "Don"	C. "Bird"	C. fem	C. Buzzy	C. Blktail	Pituophis Adult	Pit. Juv.
DATES:							
June, 2015: (anesth)							
Length:	2' 8"	4' 4"	3' 8"	4' 0"	3' 3"		
Weight:	0 lb/12oz.	3 lb/15oz.	1 lb/10oz.	3 lb/4oz.	1 lb/3oz.		
November, 2015: (anesth)							
Length:	-0-	4' 1"	3' 3"	4' 0"	3' 6"		
Weight:	1 lb/8oz.	4 lb/5oz.	2 lb/0oz.	3 lb/12oz.	1 lb/6oz.	3 lb/4oz.	
April, 2016:							
Length:	3' 0"	4' 3"	3' 5"	3' 10"	3' 3"		
Weight:	1 lb/7oz.	4 lb/3oz.	2 lb/0oz.	3 lb/12oz.	1 lb/7oz.	3 lb/5 oz.	1 lb/14 oz.
October, 2016:							
Length:	3' 5"	4' 3"	3' 4"	4' 0"	3' 6"	5' 0"	3' 11"
Weight:	2 lb/4oz.	4 lb/5oz.	2 lb/8oz.	3 lb/15oz.	1 lb/11oz.	3 lb/13oz.	2 lb/4 oz.
April, 2017:							
Length:	3' 3"	4' 4"	3' 6"	4' 2"	3' 4"	5' 0"	4' 6"
Weight:	2 lb/5oz.	4 lb/6oz.	2 lb/8oz.	4 lb/0oz.	1 lb/9oz.	3 lb/14oz.	2lb/12oz

There are a couple of anomalies in the chart (some snakes grew shorter?), but for the 2016–2017 hibernation season all snakes but one maintained or gained weight. Ray put heat pads under some of the cages, but even with temperatures dropping near 40°F, he said no snake moved to the heated spots. He had a video of a very active snake rattling and hissing at a temperature of 48°F.

A typical setup. Ray experimented with adding heat tape to some enclosures but found that the animals shunned the heat. Photograph by Ray Pawley.

So here are some of Ray's conclusions:

WHAT WAS LEARNED:

1. By managing a selected group of local species of snakes that includes hibernation:
   a. Food amounts were greatly reduced.
   b. Electrical energy costs were likewise greatly reduced.
   c. Concurrently, animal health and well-being improvements were substantially elevated.
   d. **Anabolism, a constructive metabolic process during hibernation in ectotherms needs further examination!!**
2. Rattlesnakes can hibernate with food in their gut for more than 5 months with no apparent problems.
3. Healthier results in reproductive programs can be expected.
4. Similarities of comparative circadian thermoregulatory behavior between selected **tropical** and **temperate** forms of Crotalus are nearly identical.
5. The potential for saving food and energy costs while simultaneously boosting health and well-being performances of temperate snakes is demonstrated.

And he knows more work is needed:

WHAT NEEDS TO BE DONE:

1. Conduct future hibernation studies that examines humidity as well as thermal fluctuations.
2. Test for reproduction results.
3. Examine the lymphatic system of these animals concerning its presumed role in (1) moisture uptake, (2) hydration stasis and (3) heat exchange function.
4. **Conduct further data-gathering research to determine the role of anabolism during hibernation.**
5. A potential exists for snakes to self-regulate their individual basking needs through the activation of heat elements via micro-switches.
   a. Preliminary observations regarding a lizard group at Brookfield Zoo supports this notion.

Ray says that he rarely achieved this level of fitness before he tried his hibernation methods. Photograph by Ray Pawley.

I think Ray would agree that this is not a definitive study, but the results are certainly interesting and should lead to further research. Perhaps husbandry is one of the most under-studied areas of herpetology. Trials such as Ray conducts can only advance this field where often anecdotes and traditions rule our outlook.

I've already mentioned Ray's many talents, but that isn't why I like him. I like him because of the type of person he is. Just a few quotes from his talk will demonstrate his personality. "I read the books but then I listen to the snakes." "I'm still enrolled in Herpetology 101." Both quotes are good guidance for all of us who are fascinated by these animals. At the end of his talk he thanked us and mentioned, "I did not see a single person go into hibernation during my talk." I doubt that the next time he talks to us will find any one nodding off either.

A healthy *Crotalus atrox* raised with Ray Pawley's hibernation methods. Photograph by Ray Pawley.

Herpetology 2018

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

COLUBER AND *MASTICOPHIS*

E. A. Myers et al. [2017, Copeia 105(4):640-648] note that the genus-level taxonomy of the New World racers and whipsnakes (*Coluber* and *Masticophis*) has long been contentious regarding whether the two genera are mutually exclusive clades. This argument is based on morphological characters and largely single-locus analyses. The authors examined the phylogenetic history of this group using multi-locus data in a coalescent framework, where paraphyly of *Masticophis* would result in support for the recognition of only a single genus (*Coluber*) for these species. They sampled all currently recognized species and incorporated broad geographic sampling for the more widespread species groups to explore biogeographic patterns across North America. The analyses suggest that *Masticophis* is monophyletic with respect to *Coluber constrictor*, albeit with low support. These results also demonstrate that there is undescribed cryptic diversity in this group, and the authors underscore additional avenues of study to further delimit unrecognized species in this clade. The biogeography of the island endemic, *Masticophis anthonyi*, is discussed with respect to what is known about other codistributed vertebrates. Lastly they provide an overview of the history of the arguments for or against the use of the generic name *Masticophis* and suggest its continued use.

PUERTO RICAN RACERS ON GUANA ISLAND

E. T. Hileman et al. [2017, Journal of Herpetology 51(4):454-460] report that Guana is a 297-ha island in the British Virgin Islands, a private wildlife sanctuary where human activity is largely restricted to small areas associated with an upscale resort hotel. Guana is free of mongooses and sustains a population of racers (*Borikenophis portoricensis*; Dipsadidae). Between 2001 and 2012 the authors marked *B. portoricensis* with PIT tags and recorded 394 captures of 367 unique adults (males = 167; females = 200; sex ratio of 0.8 : 1) in an effective trapping area of 25.8 ha. Using contemporary capture–recapture models, they estimated annual adult apparent survival, abundance, and realized population growth. They detected no difference in apparent adult annual survival of males (0.50, 95% confidence interval [CI] = 0.34–0.66) and females (0.50, 95% CI = 0.33–0.66). Recapture probabilities of males (0.09, 95% CI = 0.04–0.18) and females (0.08, 95% CI = 0.04–0.16) were similarly indistinguishable. Annual estimates of adult abundance ranged from 368 to 540, but confidence intervals overlapped broadly between years. Realized population growth was estimated as 0.98 (95% CI = 0.75–1.28) over the 12-yr study. Based on the effective trapping area (25.8 ha), average density was 19 adults/ha (range = 14–21 adults/ha). The low recapture probabilities suggest that animals spend much of their lives in areas not accessible to researchers, but they detected little evidence of substantive movement. The population on Guana appears to be healthy, suggesting that declines elsewhere are indeed the results of human activities, especially the introduction of mongooses.

THE TRADE IN SCORPION MUD TURTLES

S. S. de Cristo et al. [2017, The Herpetological Journal 27(4): 361-367] studied the trade network of the scorpion mud turtle, *Kinosternon scorpioides*, on Marajó Island, Brazil, from hunting to the final product consumption. They conducted semi-structured interviews at the urban centers of the cities of Soure, Salvaterra and Cachoeira do Arari, where they investigated: A) the socioeconomic profile of the merchants and their activity; B) the origin, form and the frequency of marketing *K. scorpioides*; and C) the demand for the product. Scorpion mud turtle hunting was carried out using the following methods: hand-collection (100%), probing (62%) and burning (54%). They were hunted for two reasons: personal consumption and sale, which was conducted in urban centers. The hunters knew the empirical aspects of the species biology in the wild: habitat, trophic ecology, and reproduction, among others. The trade of *K. scorpioides* is still a strong activity on Marajó Island, and the legal regulations are not enough to inhibit this practice, which poses a threat to the future of this species in this area. The establishment of educational efforts and captive breeding programs of this species will contribute to employment, to local family income, and to the conservation of this genetic resource. These efforts also be important for that the local population could produce and consume this species in a more sustainable way.

AGGRESSION IN NEONATE SKINKS

M. A. Paulissen and D. A. Moran [2017, Journal of Herpetology 51(4):477-481] studied aggressive behavior of neonate five-lined skinks (*Plestiodon fasciatus*) in a controlled laboratory study. Two neonates of differing sizes were placed on opposite sides of a divided observation chamber for 48 h. Then the partition was removed, a single retreat placed in the center of the chamber, and the behaviors of the two neonates recorded for 60 min. The neonate skinks did not interact unless they were within one body length of each other. During an encounter, one lizard typically displayed aggressive behavior (lunging) while the other lizard displayed submissive behavior (avoidance/fleeing), though in 24% of encounters the two lizards showed no reaction. Dominant lizards won significantly more encounters than subordinate lizards. The subordinate lizards displayed tail wiggling behavior significantly more frequently than dominant lizards, suggesting this behavior may be a visual signal of subordinate status. The larger lizard was dominant in 75% of the trials, and as relative size of the dominant lizard increased, so did its percentage of encounters won. The two lizards spent significantly more time on opposite sides of the observation chamber than on the same side, because the subordinate almost always fled from the dominant, often to the opposite side of the chamber. Nevertheless, the two lizards frequently used the retreat at the same time. These results suggest that, in the field, small neonates usually will be subordinate to (and avoid) larger ones while active on the surface, but will readily share retreat sites with larger neonates.

Advertisements

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale or trade: Probable pair of albino Harquahala rosy boas. They were born in my home in late 2016 and are feeding on f/t peach fuzz mice. Pure locality animals exhibiting a recessive gene. Viewing is possible, parents on site. I can drive to meet a reasonable distance, or ship if you are not local. Discount if you pick them up from my home. Cash, credit card or PayPal. Call or text 510-318-1715, or email elenabmoss@gmail.com.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http:// hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

NEW CHS MEMBERS THIS MONTH

Heather Thom
Breanna Lange
Steve Brown
Kellie Coviello Kelly
Nick Balassone

2018 CHS GRANT RECIPIENTS

The CHS Grants Committee has chosen the CHS grant recipients for 2018. The committee consisted of John Archer, Michael Dloogatch, Gery Herrmann, Robert Jadin, Linda Malawy and Jessica Wadleigh. This year we received 18 applications. After a difficult decision process, ten grants were awarded, as follows:

- Christopher Alkali, Department of Biology, University of North Carolina at Chapel Hill. "The Evolution of Imprecise Coral Snake Mimicry," $1,000.
- Sarah J. Baker, Illinois Natural History Survey. "Immunologic Response of Illinois Snake Species to Snake Fungal Disease," $1,000.
- Catherine Chen, Department of Biology, University of North Carolina at Chapel Hill. "The Role and Evolutionary Significance of Multimodal Signaling in Hybridizing Spadefoot Toads," $1,000.
- Jurica-Suchy Nature Museum. "Rebounding Blanding's: Conservation-based Outreach and Education," $500.
- Michaela Lambert, Department of Forestry and Natural Resource Sciences, University of Kentucky. "Factors Affecting Amphibian Occupancy, Abundance, and Species Richness of Artificial Wetlands on a Reforested Surface Mine in the Monongahela National Forest, West Virginia" $1,000.
- Zachary Lange, Department of Biology, John Carroll University. "Thermal Biology and Habitat Use May Lead Terrestrial-breeding Frogs (*Pristimantis*) into an Ecological Trap," $1,000.
- Ann-Elizabeth Nash, School of Biological Sciences, University of Northern Colorado. "Social Structure of Spiny-tailed Iguanas, *Ctenosaura similis*," $1,000.
- Alexander Okamoto, Undergraduate, The University of Chicago. "Limb Anatomy of the Tortoise *Agrionemys horsfieldii*," $750.
- Christopher Pelecchia, Department of Biological Sciences, The University of Southern Mississippi, "Population Genetics of *Cyclura ricordii* and *Cyclura cornuta* south of Lago Enriquillo, Dominican Republic," $1,000.
- Justin Perrault, Loggerhead Marinelife Center, Juno Beach, Florida. "Conservation and Comprehensive Health Assessments of Gopher Tortoises (*Gopherus polyphemus*) in Juno Beach, Florida," $1,000.

SHOW SCHEDULE

In addition to ReptileFest the Chicago Herpetological Society puts on many live animal displays throughout the year. The events now scheduled for March through June are listed below. CHS members who wish to participate in an event should call, text or email ahead to Show Coordinator Gail Oomens, 847-849-3466, goomens@chicagoherp.org, to confirm.

- Notebaert Nature Museum, first full weekend of each month, Saturday and Sunday, 10 A.M. – 3 P.M.
- All Animal Expo, first Saturday & third Sunday of each month, 10 A.M. – 3 P.M., Dupage County Fairgrounds, Wheaton.
- Kids Expo, March 3–4, Saturday 9 A.M. – 5 P.M., Sunday 10 A.M. – 4 P.M., Schaumburg Convention Center, 1551 Thoreau Dr., Schaumburg.
- KidsFest, March 4, 10 A.M. – 2 P.M., 10 A.M. – 4 P.M., Oak Park Conservatory, 615 Garfield St, Oak Park.
- Chicagoland Family Pet Expo, March 16–18, Friday 1 P.M. – 9 P.M., Saturday 9 A.M. – 6 P.M., Sunday 10 A.M. – 5 P.M., Arlington Park Racetrack, Arlington Heights.
- NARBC, March 17–18, Saturday 10 A.M. – 5 P.M., Sunday 11 A.M. – 4 P.M., Tinley Park Convention Center, 18451 Convention Center Drive, Tinley Park.
- Wild Wednesday, April 11, 4 P.M. – 7 P.M., Garfield Park Conservatory, Chicago.

We've been doing it right for over 20 years

We're not stopping now

ReptileFest 2018

April 14 & 15, 2018

Northeastern Illinois University

Athletic Complex

3600 W. Foster Avenue

You're not going to miss it!

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, February 28, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Dr. Robin Warne**, assistant professor of zoology at Southern Illinois University in Carbondale will be the speaker. Dr. Warne specializes in the physiological ecology of vertebrates, and will be speaking to us about amphibian diseases.

The speaker at the March 28 meeting will be **Yatin Kalki**, an undergraduate student at the University of Illinois at Urbana-Champaign. Yatin grew up in the urban megacity of Bangalore, India, where at the age of 17 he started catching and relocating snakes that found their way into his neighbors' houses. He then went on to assist herpetologists in the Western Ghats, a mountain range in South India which is considered a biodiversity hotspot of the world. His talk, "Herping in Southern India," will first focus on his experiences herping in the highly urbanized landscape of Bangalore and then move on to the pristine rainforests of the Western Ghats and herpetofauna found there.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

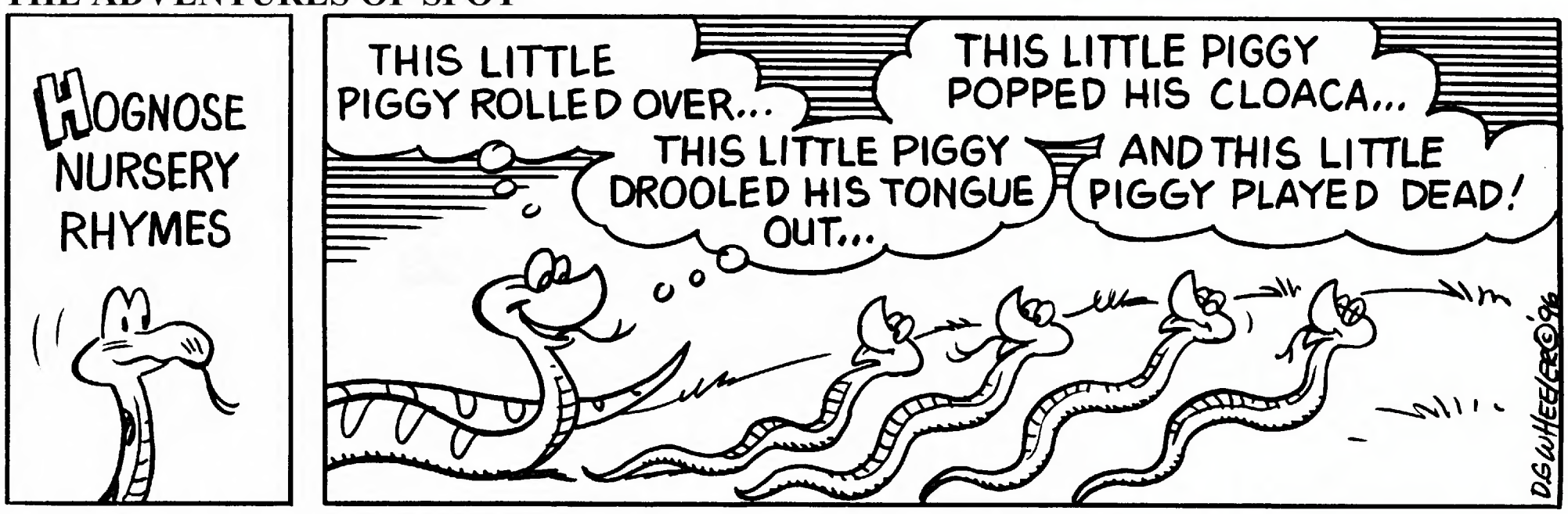
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to take place on February 16, 2018. The venue is as yet uncertain, so if you wish to attend please email mdloogatch@chicagoherp.org.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT


HOGNOSE NURSERY RHYMES
THIS LITTLE PIGGY ROLLED OVER...
THIS LITTLE PIGGY POPPED HIS CLOACA...
THIS LITTLE PIGGY DROOLED HIS TONGUE OUT...
AND THIS LITTLE PIGGY PLAYED DEAD!
DG WHEELER ©'96

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